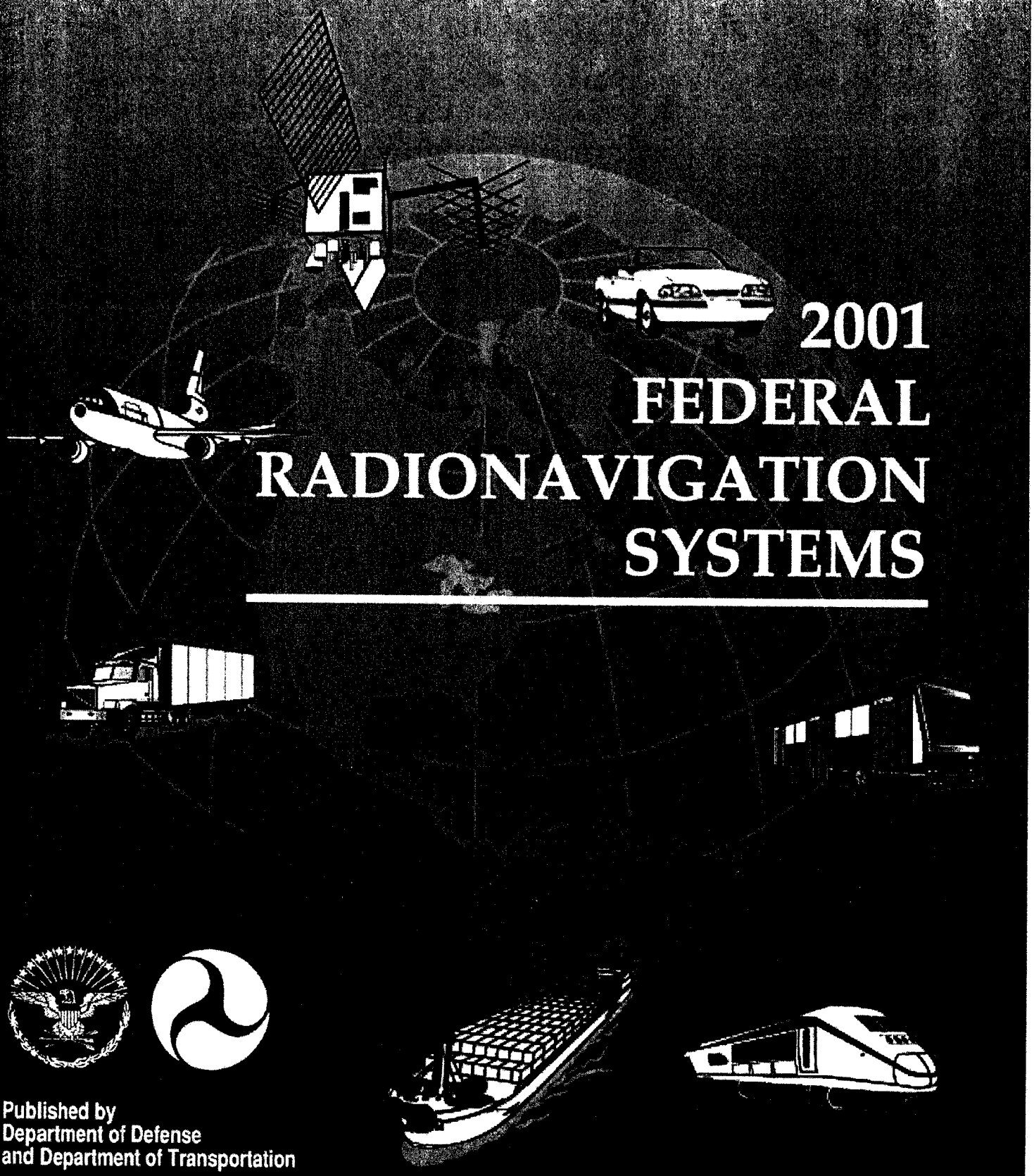

# 2001 FEDERAL RADIONAVIGATION SYSTEMS



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# 2001 Federal Radionavigation Systems

The *Federal Radionavigation Systems* (FRS) document is a companion document to the *Federal Radionavigation Plan* (FRP). It is prepared jointly by the Departments of Defense (DoD) and Transportation (DOT) with the assistance of other government agencies. The FRS covers common-use radionavigation systems (i.e., systems used by both civil and military sectors). Systems used exclusively by the military are covered in the Chairman, Joint Chiefs of Staff (CJCS) Master Positioning, Navigation, and Timing Plan (MPNTP).

Prior to this edition, Federal radionavigation information was contained in a single document, but is now published in two separate documents: the FRP and the FRS. The 2001 FRP includes the introduction, policies, operating plans, and R&D sections and will allow more efficient and responsive updates of policy and planning information. The more static sections relating to government roles and responsibilities, user requirements, and systems descriptions are now contained in the 2001 FRS and will be updated as necessary.

Your suggestions for the improvement of future editions are welcomed. Interested parties may submit their inputs to the Chairman of the DOT Positioning and Navigation (POS/NAV) Working Group (Attn: OST/P-7), Department of Transportation, Office of the Assistant Secretary for Transportation Policy, Washington, D.C. 20590.

Norman Y. Mineta
Secretary of Transportation

Date: December 12, 2001

Donald H. Rumsfeld
Secretary of Defense

Date: March 19, 2002

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# Executive Summary

This edition of Federal Radionavigation Systems (FRS) updates and replaces sections in the 1999 Federal Radionavigation Plan (FRP) relating to Government roles and responsibilities, system selection considerations, civil user requirements, and systems descriptions. The FRS is jointly prepared by the Department of Transportation (DOT) and the Department of Defense (DoD), and will be updated as necessary. Inputs for the next edition of this document are welcome. Interested parties and advisory groups from the private sector are invited to submit their inputs to the Chairman of the DOT Positioning and Navigation (POS/NAV) Working Group (Attn: OST/P-7), Department of Transportation, Office of the Assistant Secretary for Transportation Policy, Washington, D.C. 20590.

The FRS covers common-use radionavigation systems (i.e., systems used by both civil and military sectors). These systems are sometimes used in combination with each other or with other systems. Systems used exclusively by the military are covered in the Chairman, Joint Chiefs of Staff (CJCS) Master Positioning, Navigation, and Timing Plan (MPNTP).

Privately operated radionavigation systems may be discussed in order to provide a complete picture of U.S. radionavigation. The document does not include systems that mainly perform surveillance and communication functions.

lateral guidance and deviations and barometric aided (vertical) guidance and deviation information.

#### *2.2.1.3.2.3 Precision Approach*

A precision approach aid provides an aircraft with vertical and horizontal guidance and position information. The current worldwide standard systems for precision approach and landing are the Instrument Landing System (ILS), Microwave Landing System (MLS), Ground Based Augmentation Systems (GBAS), and Space Based Augmentation Systems (SBAS). International agreements have been made to achieve an all-weather landing capability through an evolutionary process, reducing landing weather minima on a step-by-step basis as technical capabilities and operational knowledge permit. The accuracy requirements for the various landing categories are shown in Table 2-1. The 95 percent accuracy requirement depends upon the error characteristics of the system, such as the frequency and correlation of errors. ILS has an angular error characteristic and has both low frequency and high-frequency components. The 95 percent accuracy for ILS at a 200-foot decision height is 4.1 meters. The Category II and III accuracy requirement is being evaluated. Aircraft use a combination of the precision approach guidance from the ILS, MLS, GLS, and a radar altimeter to accomplish a Category III approach.

Precision approach and landing systems must warn the pilot of an out-of-tolerance condition during precision approaches by removing these signals from service. The response time for providing these warnings is six seconds for Category I and two seconds for Category II and III.

#### *2.2.1.3.3 Landing*

The landing phase begins at the final approach fix (FAF) and continues through touchdown and rollout. The final approach can be based on:

- Precise lateral and vertical positive course guidance/deviation information (precision approach).
- Lateral and vertical positive course guidance/deviation information derived from an area navigation system (e.g., LNAV/VNAV).
- Lateral course guidance/deviation information and minimum descent altitudes (i.e., nonprecision approaches).

### *2.2.1.4 Surface Phase*

Surface operations include navigation on the airport surface to and from the active runway. These operations are conducted visually.

## *2.2.2 Evolving Aviation Navigation Requirements*

In accordance with the ICAO Global Air Navigation Plan for CNS/ATM Systems (ICAO Document 9750) and international agreements, the concepts of RNAV, RNP and RNP RNAV are being applied to aircraft operations.